Herbal nutritional intervention for long-term infection with multidrug-resistant *Acinetobacter baumannii* combined with ALS: a clinical case report

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Abstract

We report a male patient with amyotrophic lateral sclerosis (ALS) for three years, infected with multidrug-resistant organisms (MDRO), primarily *Acinetobacter baumannii* (AB), for over a year. Following a nutritional intervention with two herbal beverages, i.e., Sang Shen Pu Gong Ying (SSPGY) and Wu Zhi Mao Tao Hong Zao (WZMTHZ), no AB was detected in the patient's samples, and levels of leukocytes, neutrophils, and lymphocytes become to be normalized. This case suggests that the herbal nutritional drink significantly intervenes in long-term MDRO-AB infections with potent antimicrobial properties and is safe with no side effects, offering a novel and breakthrough strategy for MDROs infection research.

Keywords: Multiple drug-resistant organism (MDRO); Amyotrophic lateral sclerosis (ALS); *Acinetobacter baumannii* (AB); Herbal nutritional intervention; Medicinal food ingredients

1. Introduction

Multidrug-resistant organisms (MDROs), which are resistant to three or more classes of commonly used antibiotics, represent a growing threat to global healthcare [1]. *Acinetobacter baumannii* [2] (AB), a prevalent hospital-acquired pathogen, is particularly concerning due to its high resistance profile and its association with severe infections such as pneumonia, urinary tract infections, and sepsis. Recent studies highlight a global rise in AB infections, especially within hospital settings, where its spread is accelerating, particularly in intensive care units [3]. Furthermore, the increasing resistance to carbapenem antibiotics exacerbates the challenge of treating AB infections, underscoring its status as a critical public health threat [4]. Given the urgency of this issue, the development of new antimicrobial therapies is essential. Risk factors for AB infections include advanced age, compromised immune systems, invasive procedures, mechanical ventilation, and prolonged hospital stays [5].

Patients with amyotrophic lateral sclerosis (ALS) are particularly vulnerable, as the progressive nature of the disease often necessitates long-term hospitalization and the use of invasive medical devices, such as catheters and ventilators, thereby increasing their risk of acquiring MDRO infections, including AB. Tragically, many ALS patients succumb to sepsis and multi-organ failure, frequently as a result of respiratory infections caused by MDROs.

This study presents a retrospective analysis of an ALS patient who developed an MDRO infection, specifically AB, in the context of a prior ischemic stroke. The patient was treated with two herbal nutritional beverages, leading to substantial improvements in clinical symptoms and a significant reduction in inflammatory markers. Notably, MDRO-AB was eradicated, suggesting that herbal nutritional interventions may offer a promising and impactful strategy in the treatment of MDRO

infections. These findings open the door to further exploration of alternative therapies in managing MDRO infections, particularly in vulnerable patient populations such as those with ALS.

2. Case Report

The patient, a 57-year-old male with a three-year history of ALS and a longstanding MDRO-AB infection underwent herbal nutritional treatment at a local rehabilitation and nursing home from May 6 to Jul. 12, 2024.

The herbal nutritional treatment included two herbal beverages, i.e., Sang Shen Pu Gong Ying (SSPGY) and Wu Zhi Mao Tao Hong Zao (WZMTHZ), both developed by Hong Kong TungTakSim Biotechnology Co., Ltd. SSPGY's main ingredients are mulberry, dandelion, ginger, honey, and bitter melon, etc.; while WZMTHZ includes five-finger hairy peach, red date, mulberry, yam. The specifics of the treatment protocol, including dosage and duration, are summarized in Table 1.

Table 1 Type and time of taking herbal drinking in 2024

Time	Type of herbal drinking	Duration of days (d)
May. 6-May 14	SSPGY	9
May 15-Jun. 5	WZMTHZ	22
Jun. 13-Jul. 12	WZMTHZ	30

Abbr: SSPGY: Sang Shen Pu Gong Ying; WZMTHZ: Wu Zhi Mao Tao Hong Zao

Figure 1

From May 6-14, 2024, the patient received two vials per day (600 mL) of SSPGY, administered by family members. From May 15 to Jun. 6, and again from Jun. 13 to Jul. 12, the patient received the same dosage of WZMTHZ. Bacterial cultures were conducted in collaboration with Wanning Hospital and South China Hospital of Shenzhen University. On May 6, a urine culture at Wanning Hospital identified

MDRO-AB. Subsequent cultures on May 17 and Jun. 8, performed at South China Hospital of Shenzhen University, confirmed the elimination of MDRO-AB, with the patient remaining clinically stable. However, during a brief discontinuation of treatment from Jun. 6-12, 2024, the infection reemerged, indicating a hospital-acquired reinfection. Upon resumption of WZMTHZ treatment on Jun. 13, urine cultures by Jun. 19 showed no bacterial growth. Four additional cultures confirmed the complete eradication of MDRO-AB. Throughout the treatment, the patient's inflammatory markers normalized, and no adverse effects were observed. The patient, now free of symptoms, was discharged to home care. A timeline of the patient's treatment and clinical course is illustrated in Figure 1.

Figure 2

Figure 3

Figure 2 illustrates that leukocyte, neutrophil, and lymphocyte levels remained within the normal range throughout the treatment with SSPGY and WZMTHZ, suggesting an absence of infection symptoms. In contrast, as shown in Figure 3, while procalcitonin (PCT) levels remained stable and within the normal range; C-reactive protein (CRP) levels exhibited significant fluctuations, consistently abnormal. The course of hospitalization and bacterial test results were demonstrated in the supplementary information.

3. Discussion

In this case, the patient, despite being immunocompromised and infected with MDRO-AB, achieved significant improvement through herbal nutritional support. Notably, the herbal interventions successfully eradicated MDRO-AB and improved inflammatory markers, even in the context of ineffective prolonged conventional antibiotic therapy. Multiple bacterial cultures from both urine and sputum confirmed

the complete elimination of MDRO-AB. This case underscores the potential of herbal nutritional drinks, derived from both medicinal and food sources, as an effective treatment for MDRO infections. The findings suggest that WZMTHZ, in particular, played a critical role by potentially enhancing the patient's immune response through various mechanisms, improving the body's ability to combat pathogenic microorganisms and leading to the eradication of the infection.

This case report highlights three key points: (1) The active ingredients in the herbal nutritional drinks effectively targeted and inhibited disease-causing microorganisms, significantly reducing MDROs in the patient. This demonstrates the potential value of herbal nutritional interventions in managing MDRO infections; (2) The observed changes in inflammatory markers suggest that the herbal intervention may have positively influenced the patient's immune system, possibly by activating and regulating immune responses, thereby enhancing the body's ability to clear the infection; (3) In cases of prolonged MDRO infection with antibiotic failure, herbal nutritional interventions present a promising, safe, and effective alternative for treating MDRO-infected patients.

This study represents the first reported use of herbal nutrition to intervene in critically ill patients with MDRO-AB infection, introducing a novel approach to managing MDRO infections. Although the study has limitations, including its retrospective design, single-patient case, and lack of a randomized control group, it offers valuable insights for future research. The case demonstrates the potential of WZMTHZ in alleviating infection symptoms and highlights the need for further exploration into its therapeutic efficacy. Future studies will delve deeper into the potential and mechanisms of SSPGY and WZMTHZ in treating MDRO infections. We encourage the broader medical research community to investigate the significant

potential of herbal nutrition as an effective intervention for managing MDRO infections, which could offer a promising alternative to conventional treatments.

4. Conclusion

This case report provides valuable clinical insights into the potential role of herbal nutritional interventions in managing MDRO infections, offering a scientific foundation for future studies in this area. It highlights the rapid and effective impact of herbal nutrition on MDRO infections, demonstrating both its safety and the absence of adverse effects. Future research should focus on elucidating the antibacterial mechanisms of medicinal foods and herbal nutrition, particularly their roles in modulating immune responses and inhibiting bacterial resistance. Such investigations could pave the way for innovative approaches in biomedical science, with significant implications for human health. The multi-centered, randomized, controlled clinical trials and mechanism studies of efficacy are need to be carried out.

Conflict of Interests

Both Chihim Mak and Chihang Mak, who are senior executives at the Hong Kong TungTakSim Biotechnology Co., Ltd., supported the research and did not receive any personal financial compensation for their work. All other authors declare no conflict of interest.

Ethics

This study was approved by the Ethics Committee of South China Hospital of Shenzhen University (No. HNLS20240827001-A); The registration number of the International Traditional Medicine Clinical Trial Registration platform (ITMCTR2024000750).

Informed consent

The patient was provided written informed consent.

Acknowledgments

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Figure Captions

Fig. 1 Timeline of herbal nutritional interventions

Fig. 2 WBC, NEUT and LYM indices during the patient's treatment period

Fig. 3 PCT and CRP values detected during the treatment of patient

Figures

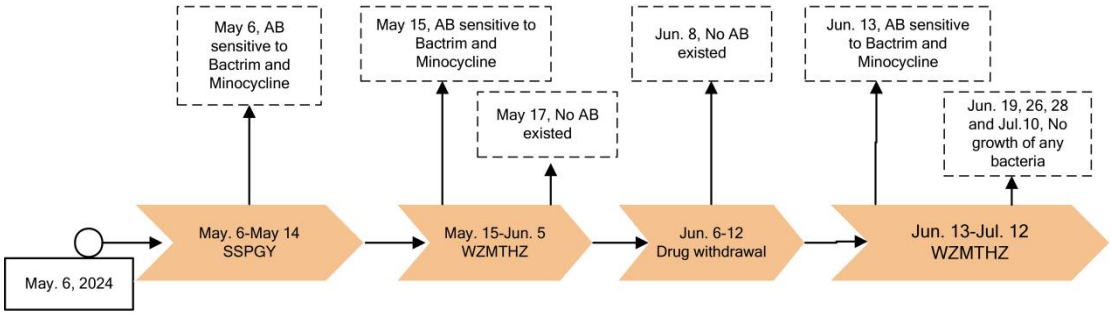

Fig.1

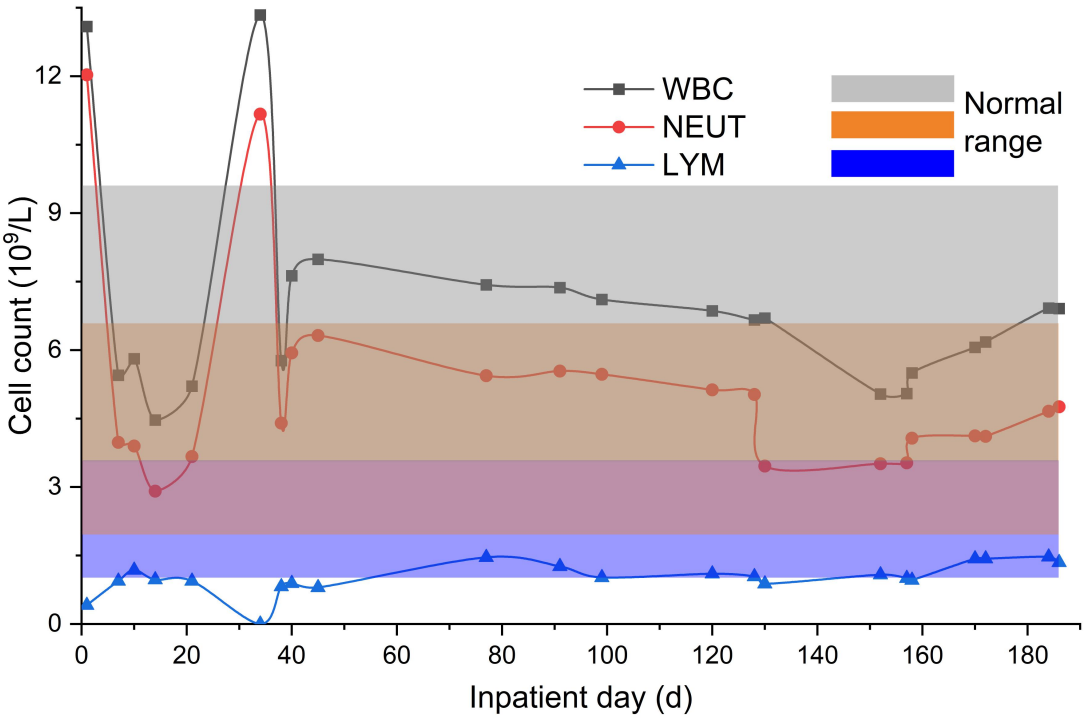
WBC
NEUT
LYM
Normal range
Cell count (10^9/L)
Inpatient day (d)
0
3
6
9
12
0
20
40
60
80
100
120
140
160
180

Fig. 2

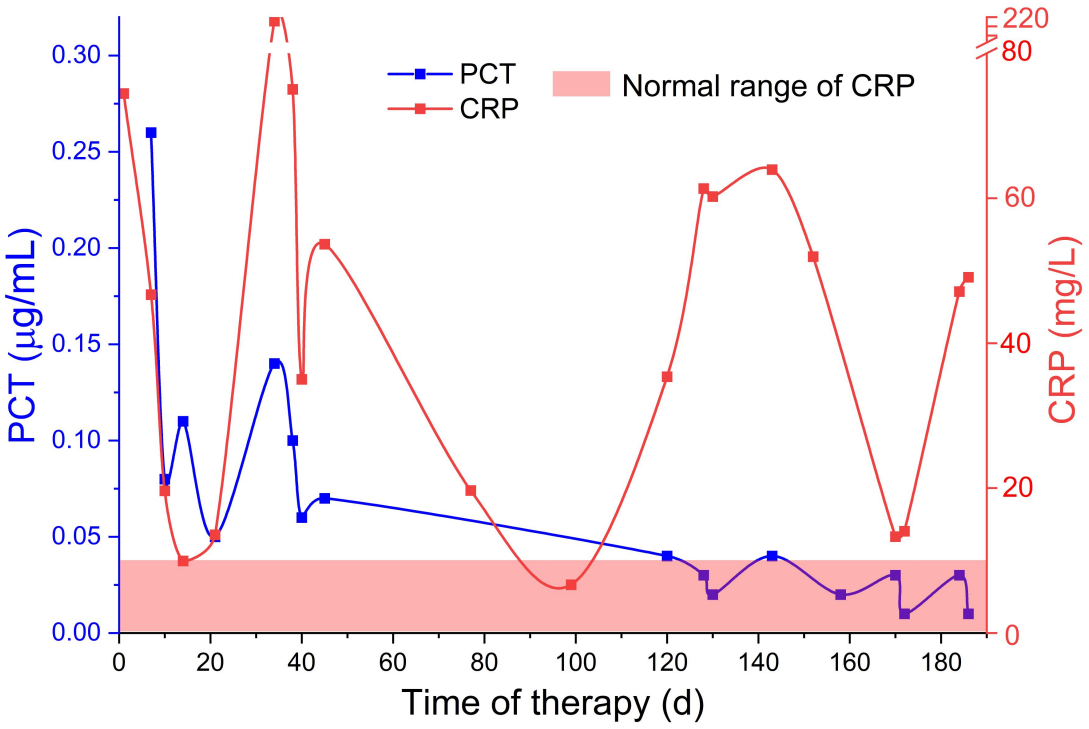
PCT
CRP
Normal range of CRP
PCT (µg/mL)
CRP (mg/L)
Time of therapy (d)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0
20
40
60
80
100
120
140
160
180
220
80
60
40
20
0

Fig. 3